UIT-RGPV (Autonomous), BHOPAL

Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem.	Mid Sem. Tests (Two tests Average)	Quiz, assignment	End Sem.	Lab assignment	L	T	P
EC-3501	Voice & Data Communication	**100**	**30**	**20**	**-**	**-**	**3**	**1**	**-**

Course Contents

Unit I Telephone instruments and signals : Introduction, the subscriber loop, standard telephone set, basic call procedure, call progress tones and signals, cordless telephones, caller identification, electronic telephones.**Telephone circuit** Introduction, the local subscriber loop, channel noise and units of power measurements, transmission parameters, voice frequency circuit arrangements, crosstalk.

Unit II Public telephone network : Introduction, transmission system environment, public telephone network, instruments, local loops, trunk circuits, - local central and operator-assisted exchanges, automated central office switches and exchanges, telephone numbering plan, telephone services, telephone switching hierarchy, common channel signaling system.

Unit III Multiplexing of telephone channels: Introduction, time division multiplexing, T1 digital carrier, digital hierarchy, digital carrier line encoding, T carrier systems, digital carrier frame synchronization, bit versus word interleaving, statistical TDM, codecs and combo chips, frequency division multiplexing, FDM hierarchy, composite baseband signal, formation of mastergroup, wavelength division multiplexing.

Unit IV Data Communications : Components, protocols and standards, standards organizations, line configuration, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media- guided and unguided, transmission impairment, performance, wavelength and Shannon capacity.

Unit V Error detection and correction : Types of error, error detection- redundancy check (longitudinal, vertical and cyclic), checksum, error correction-hamming code. **Switching** Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and datagram approach), message switching.

References:

1. Tomasi: Advanced Electronic Communication Systems, PHI Learning.
2. Forouzan: Data Communications and Networking, TMH.
3. Tomasi: Introduction to Data Communication Systems, Pearson Education.
4. William Stallings: Data and Computer Communications, Pearson Education
5. Brijendra Singh: Data Communications and Networks, PHI Learning.

UIT-RGPV (Autonomous), BHOPAL

Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem.	Mid Sem. Tests (Two tests Average)	Quiz, assignment	End Sem.	Lab assignment	L	T	P
EC-3502	Control Systems	100	30	20	-	-	3	1	-

Course Contents

Unit-I **Control system :**Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, block diagram representation and reduction, signal flow graph techniques. **Feedback characteristics of control systems** Feedback and non-feedback systems, reduction of parameter variations by use of feedback, control over system dynamics and effects of disturbances by the use of feedback, linearization effect of feedback, regenerative feedback.

Unit-II **Time response analysis** : Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.**Time domain stability analysis** Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-III **Frequency response analysis**:Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots..**Frequency domain stability analysis** Nyquist stability criterion, assessment of relative stability using Nyquist Criterion (phase margin, gain margin and stability), closed-loop frequency response.

Unit-IV **Approaches to system design:** Design problem, types of compensation, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation. **Digital control systems** System with digital controller, difference equations, the z-transform, pulse transfer function, inverse z-transform, the s and z domain relationship.

Unit-V **Concept of state, state variables and state model**: State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

References:

1. Nagrath and Gopal: Control System Engineering, New Age International Publishers.
2. Kuo: Automatic Control Systems, PHI Learning.
3. Varmah: Control Systems, TMH.
4. Distefano (Schaum series): Control Systems, TMH
5. Manke: Linear Control System, Khanna Publishers.
6. Stefani, Shahian: Design of feedback control systems, Oxford University Press.
7. Ogata: Modern Control Engineering, PHI Learning.

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Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem.	Mid Sem. Tests (Two tests Average)	Quiz, assignment	End Sem.	Lab assignment	L	T	P
EC-3503	Communication Systems	100	30	20	30	20	3	1	2

Course Contents

Unit I Communications: Introduction: Modulation and its types, signal energy and energy spectral density, essential bandwidth of a signal, energy of modulated signal, signal power and power spectral density, Amplitude Modulation Amplitude modulated wave, bandwidth and average power of AM wave, modulation index, modulation by several sine waves, Double Side Band Suppressed carrier (DSB-SC), Single Side Band (SSC), Vestigial Side Band (VSB), AM modulators and demodulators, comparison and applications of various AM systems.

Unit II Angle Modulation :Instantaneous frequency, Frequency Modulated and Phase Modulated signals, modulation index, bandwidth requirement for angle modulated waves, Sinusoidal FM, spectrum and average power of sinusoidal modulated FM wave, Sinusoidal PM, FM generators and detectors, Phase modulators and demodulators, comparison of FM and PM, comparison of AM, PM and FM.

Unit III Pulse Modulation Sampling :Theorem, aliasing and anti-aliasing, recovery and reconstruction filter, types of sampling, Pulse Amplitude Modulation (PAM), PAM-TDM, Pulse Width Modulation (PWM), Pulse Position Modulation (PPM). Quantization, quantization error, Pulse Code Modulation (PCM), companding, Differential PCM, Delta Modulation (DM), Adaptive Delta Modulation (ADM).

Unit IV Digital Modulation :Phase Shift Keying (PSK)- Binary PSK, M-ary PSK, Quadrature PSK.Frequency Shift Keying (FSK)- Binary FSK (orthogonal and non-orthogonal), M-ary FSK.Minimum Shift Keying (MSK), Quadrature Amplitude Modulation (QAM), comparison of digital modulation techniques.

Unit V Noise :Introduction, types of noise- internal and external, signal to noise ratio (SNR), noise figure, noise temperature, calculation of noise factor and noise temperature, noise in AM and Angle modulated systems. Relation between probability of error and SNR.

References:

1. Taub and Schilling: Principles of Communication Systems, TMH.
2. Simon Haykin: Communication Systems, Wiley India.
3. Lathi: Modern Digital and Analog Communication Systems, Oxford University Press.
4. Chandra Sekar: Communication Systems, Oxford University Press.
5. Skylar and Ray: Digital Communications, Pearson Education.
6. Singal: Analog and Digital Communications, TMH,

List of Experiments:

1. Analysis of AM, FM, PM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of Pulse modulation techniques.
3. Analysis of Shift keying techniques.
4. Simulations of BPSK, BFSK, MSK, QAM and calculations of probability of error.

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Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem.	Mid Sem. Tests (Two tests Average)	Quiz, assignment	End Sem.	Lab assignment	L	T	P
EC-3504	Microprocessors & Embedded Systems	100	30	20	30	20	4	1	2

Course Contents

Unit I Microprocessors: Introduction Origin of microprocessors, classification, comparison of 8085 and 8086 **microprocessors.** Architecture of 8086 Microprocessor BIU and EU, register organization, pin diagram, memory organization, clock generator 8284, buffers, latches and transceivers, 8288 bus controller, maximum and minimum modes.

Unit II Assembly Language Programming of 8086 : Instruction formats, addressing modes, instruction set, assembly language programming, ALP tools- editor, assembler, linker, locator, debugger, emulator. 8086 based multiprocessor systems Interconnection topologies, coprocessors 8087 NDP, I/O processors 8089 IOP, bus arbitration and control, lightly and tightly coupled systems.

Unit III Peripheral devices and their interfacing: Memory interfacing, Programmable input/output ports 8255, Programmable interval timer 8253, Programmable communication interface 8251 USART.**Interrupts of 8086** Interrupts and interrupt service routine, interrupt cycle, maskable and non-maskable interrupts, interrupt programming. Programmable interrupt controller 8259. **DMA in 8086** Basic DMA operation, modes of DMA transfer, DMA controller 8257.

Unit IV 8051 Microcontroller: Features, architecture, Pin Diagram, memory organization, external memory interfacing, serial and parallel I/O ports, timers, interrupts, instruction syntax, data types, subroutines, addressing Modes, instruction set, ALP of 8051, applications of 8051.

Unit V Embedded Systems : Processor embedded into a system, embedded hardware units in a system, embedded software, software tools in design, examples of embedded systems, classification of embedded systems, design process in embedded system, design metrics, abstraction of steps in the design process, challenges in embedded system design, applications of embedded systems, smart card.

References:

1. Ray and Bhurchandi: Advanced microprocessors and peripherals, TMH.
2. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
3. Senthil Kumar: Microprocessors and interfacing, Oxford University press.
4. Bahadure: Microprocessors 8086 and Pentium family, PHI Learning.
5. Udayashankara and Mallikarjunaswamy: 8051 Microcontroller, TMH.
6. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education
7. Raj Kamal: Embedded Systems, TMH.

List of Experiments:

1. Assembly Language Programs of Microprocessor 8086.
2. Assembly Language Programs of Microcontroller 8051.
3. Assembly Language Programs for Interfacing Chips.

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Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem.	Mid Sem. Tests (Two tests Average)	Quiz, assignment	End Sem.	Lab assignment	L	T	P
EC-3505	Communication Network and Transmission Lines	**100**	**30**	**20**	**30**	**20**	**4**	**1**	**2**

Course Contents

Unit I Characteristic Parameters of symmetrical and asymmetrical two port networks and their design: Image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient , iterative transfer coefficient, Lattice and Bridged T networks, reactive matching networks, matching techniques, insertion loss, symmetrical and asymmetrical attenuators and their design.

Unit II Passive LC Filters: Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Unit III Positive real function: LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

Unit IV Transmission line fundamentals : Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, liner reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault, construction and design of two wire line and coaxial cable.

Unit V Line at radio frequencies : Parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip lines and its analysis.

References:

1. Ryder: Networks and Transmission Lines, PHI Learning.
2. Valkenberg: Introduction to Modern Network synthesis, Wiley India.
3. Suresh: Electric Circuits and Networks, Pearson Education.
4. Raju: Electromagnetic field theory and Transmission Lines, Pearson Education.
5. Ganesan: Transmission Lines and Waveguides, TMH.
6. Rao: Electromagnetic Waves and Transmission Lines, PHI learning.

UIT-RGPV (Autonomous), BHOPAL

Branch: Electronics & Communication Engineering V Semester

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	4
EC-3541	Software Lab-III	-	-	-	60	40	0	0	4	

Course Contents

Study of simulation software (any one Scilab/ MatLab etc.)

Introduction to Scilab / Matlab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs.

Overview and Study of the key features and applications of the software.
Application of the software in the field of Control Systems, Data Communications and Communication Systems.

1. Programs Related to Control System- open-loop and closed loop control system, frequency response plots, determining transient response, specifications of second order system, effect of PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.
2. Programs Related to Communication Systems- Simulation of a Communication System (Generation, addition of noise and Detection),
3. Programs related to Data Communications- simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

References:

1. Rudra Pratap: Getting Started with MATLAB, Oxford University Press.
2. Vinu V. Das: Programming in Scilab, New Age Publisher.
3. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
4. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
5. Singh and Chaudhari: Matlab Programming, PHI Learning.
6. Kuo: Automatic Control Systems, PHI Learning.
7. B.S. Manke: Linear Control Systems - with MATLAB Application, Khanna Publishers.

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Branch: Electronics & Communication Engineering VI Semester

Subject Code	Subject	Maximum Marks					Credits		
		Theory			Practical				
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P
EC3551	Industrial Electronics	100	30	20	-	-	3	1	0

Course Contents

Unit-I Power Supplies : Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers . Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boost, buk-boost, cuk converters).

Unit-II Thyristors : Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggereing methods of SCR circuits, types of commutation, comparison of thyristors and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, series and parallel operation of sCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers).

Unit-III Other members of SCR family : Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, power MOSFET, Insulated gate bipolar transistor (IGBT), loss of power in semiconductor devices, comparison between power MOSFET, power transistor and power IGBT.

Unit-IV Applications of OP-AMP : Basics of OP-AMP, relaxation oscillator, window comparator, Op-amp as rectangular to triangular pulse converter and vice- versa, Wien bridge oscillator, function generator, frequency response of OP-AMP, simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP-AMP.

Unit-V Programmable Logic Controller (PLC) : Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, comparison of PLC with process control computer system, factors to be considered in selecting PLC, functional block diagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process control applications of PLC, Programming examples.

References:

1. Bishwanath Paul: Industrial Electronics and control, PHI Learning.
2. Rashid: Power Electronics- Circuits, devices and applications, Pearson Education.
3. Sen: Power Electronics, TMH
4. Bhimbra: Power Electronics, Khanna Publishers.
5. Moorthi: Power Electronics, Oxford University Press.
6. Webb: Programmable Logic Controllers- Principles and Applications, PHI Learning.

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Branch: Electronics & Communication Engineering VI Semester

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	4
EC3552	Cellular Mobile Communications	100	30	20	-	-	3	1	0	

Course Contents

Unit-I Introduction to cellular mobile system :A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system. **Elements of cellular radio system design** General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II Cell coverage for signal and traffic :General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.**Cell site antennas and mobile antennas** Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III Cochannel interference reduction : Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference. **Types of Noncochannel interference** Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV Frequency management and Channel Assignment: Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers **Handoffs and dropped calls** Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V Digital Cellular Systems :GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme. CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

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

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Branch: Electronics & Communication Engineering VI Semester

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	
EC 3553	Digital Signal Processing	100	30	20	30	20	3	1	2	6

Course Contents

Unit–I Discrete-Time Signals and Systems: Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

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

Unit – III Frequency Analysis of Discrete Time Signals: Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit – IV Efficient Computation of the DFT FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for 'N' composite number.

Unit – V Digital filters Design Techniques: Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques- rectangular and other windows, examples of FIR filters, design using windowing.

References:

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

List of Experiments:

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

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Branch: Electronics & Communication Engineering VI Semester

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	
EC3554	Antennas and Wave Propagation	100	30	20	30	20	4	1	2	7

Course Contents

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

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

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

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

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

References:

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

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Branch: Electronics & Communication Engineering VI Semester

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	
EC3555	VLSI Circuits and Systems	100	30	20	30	20	4	1	2	7

Course Contents

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

Unit II Specification of sequential systems: Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

Unit III Asynchronous Sequential Machine: Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

Unit IV State Machine :Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

Unit V Fault Detection in combinational circuit:Types of faults, Fault detection using Boolean Difference and path sensitization method.Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Refrences:

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

Subject Code	Subject	Maximum Marks					Credits			Total credits
		Theory			Practical					
		End Sem	Mid Sem. Tests (Two tests Average)	Quiz, Assignment	End Sem.	Lab Assignment	L	T	P	
EC3591	Software Lab- IV	-	-	-	60	40	-	-	4	4

Course Contents

VHDL

Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioral 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.