



SYLLABUS
SCHOOL OF DISTANCE EDUCATION
ANDHRA UNIVERSITY, VISAKHAPATNAM.
B.E./B.TECH. –ELECTRONICS &
COMMUNICATION ENGINEERING
IIIrd Year

DMECE-301: ANTENNAS AND WAVE PROPAGATION

Unit - I

Radiation and Antennas

Antenna definition, Functions of antennas, Network theorems, Properties of antennas, Antenna parameters, Antenna impedance, Radiation resistance, Directional characteristics, Effective length of antenna, Radiation intensity Directive gain, Directivity, Power gain, Antenna efficiency, Effective area Antenna equivalent circuit, Antenna bandwidth, Front-to-back ratio Polarization, Basic antenna elements, Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields Hertzian dipole, Different current distributions in linear antennas Radiation from half-wave dipole, Radiation from quarter wave monopole Radiation characteristics of dipoles

Unit - II

Analysis of antennas, Linear Arrays & Synthesis:

Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First

sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas - Friis formula, Antenna temperature and signal-to-noise ratio, Synthesis methods, Schelkunoff polynomial method, Fourier transform method, Line source design by Fourier transform method, Design of linear array by Fourier transform method, Linear array design by Woodward-lawson method, Dolph-chebyshev method (Tschebyscheff distribution) Determination of dolph chebyshev amplitude distribution, Advantages of dolph-tchebyscheff method, Taylor method, Laplace transform method, Standard amplitude distributions, Two element interferometer, Uniform distribution, Circular distribution, Parabolic distribution, Cosinusoidal distribution, Raised cosinusoidal distribution, Triangular distribution

Unit - III

HF, VHF AND UHF and Microwave ANTENNAS

Isotropic radiators, Directional antennas, Omni-directional antennas, Resonant antennas, Non-resonant antennas, LF antennas, Antennas for HF, VHF and UHF, Dipole arrays, Broadside arrays, End-fire arrays, Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna

Unit - IV

ANTENNA MEASUREMENTS

Drawbacks of measurements of antenna parameters, Methods to overcome drawbacks in measurements, Some methods for accurate measurements, Measurements ranges, TEM Cell, GTEM Cell, Outdoor range, Indoor range, Reflected ranges, Slant range, Elevated range, Compact range, Anechoic chambers, Near field range, Ground range,

Radar cross-section range, Differences between indoor and outdoor ranges, Antenna impedance measurements, Impedance measurement by wheatstone bridge method, Impedance measurement by slotted line method, Measurement of mutual impedance between two antennas, Measurement of radiation resistance, Gain measurement by two antennas, Gain measurement by three antennas, Gain measurement by reflection from ground, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement

Unit - V

WAVE PROPAGATION

Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave , Ground wave field strength, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Space wave or Tropospheric wave propagation Field strength due to space wave, Considerations in space wave propagation Effect of the curvature of earth, Effect of earth's imperfections and roughness, Effect of hills, buildings and obstacles, Effect of the height above the earth, Effect of transition between ground and space waves, Effect of polarization, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities , Mechanism of ionospheric propagation, reflection and refraction, Characteristic parameters of ionospheric propagation, Virtual height, Critical frequency, MUF, Skip distance, LUF, Critical angle ,OWF, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Ionospheric abnormalities, Ionospheric storms, Sudden ionospheric disturbances (SID), Sun spot cycle, Tides and winds in the ionosphere, Whistlers, Effect of earth's magnetic field

Text Book:

Antennas and Wave Propagation by G S N Raju, Pearson Education, (Singapore), 2005

Reference Books:

1. Antennas for All Applications by John D.Kraus and Ronald J. Marhetha, TMHI, 3rd Edn. 2003.
2. Antenna Theory – C.A. Balanis, John Wiley & Sons, 2nd ed., 2001.
3. Electromagnetic Waves and Radiating Systems by E.C.Jordan and K.G.Balmain, PHI, 2nd ed., 2000.

DMECE-302: DIGITAL SIGNAL PROCESSING

1. **Applications of Z – Transforms:** System functions $H(Z)$ of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects.
2. **Discrete Fourier Transform (DFT):** Properties of The DFS, DFS Representation of Periodic sequences, Properties of DFT, Convolution of Sequences.
3. **Fast – Fourier Transforms (FFT):** Radix – 2 Decimation – in – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.
4. **IIR Digital Filter Design Techniques:** Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximation). Frequency transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, step and Impulse invariance Technique.
5. **Design of FIR Filters:** Fourier series Method, Window Function Techniques, Comparison of IIR and FIR Filters.
6. **Applications:** Applications of FFT in Spectrum Analysis and Filtering, Application of DSP in Speech Processing.

Text Books:

Alan V.Oppenheim and Ronald W.Schafer: Digital Signal Processing, PHI.

References:

1. Sanjit K.Mitra, Digital Signal Processing “A – Computer Based Approach”, Tata McGraw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S.P.Eugene Xavier, Signals, Systems and Signal Processing. S.Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata McGraw Hill.

DMECE 303 SWITCHING THEORY AND LOGIC DESIGN

UNIT-I

Boolean Algebra and Logic gates and gate level minimization:

Basic definitions, Axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, Canonical and standard forms, Other logic operations, Digital logic gates, Integrated circuits, The map method, Four-variable map, Five-variable map, Product of sums simplification, Don't-care conditions, NAND and NOR implementation, Other two-level implementations, Exclusive-OR function, Hardware description language (HDL)

UNIT - II

Combinational Logic: Combinational circuits, Analysis procedure, Design procedure, binary adder-subtractor, Decimal adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits

UNIT - III

Synchronous Sequential Logic, Registers and Counters: Sequential circuits, Latches, Flip-flops, Analysis of clocked sequential circuits, HDL for sequential circuits, State reduction and assignment, Design procedure, Registers, Shift registers, Ripple counters, Synchronous counters, Other counters, HDL for registers and counters

UNIT - IV

Memory and Programmable Logic and Register Transfer

Level: Introduction, Random-access memory, Memory decoding, Error detection and correction, Read-only memory, programmable logic array, Programmable array logic, sequential Programmable devices, Register transfer level (RTL) notation, Register transfer level in HDL, Algorithmic state machines (ASM), Design example, HDL description of design example, Binary multiplier, Control logic, HDL description of binary multiplier, Design with multiplexers

UNIT - V

Digital Integrated Circuits and VHDL: Introduction, Special characteristics, Bipolar-transistor characteristics, RTL and DTL circuits, Transistor-transistor logic (TTL), Emitter-coupled logic (ECL), Metal-oxide semiconductor (MOS), Complementary MOS (CMOS), CMOS transmission gate circuits, Switch-level modeling with HDL, Introduction to VHDL

Text Book :

Digital Design by M. Morris Mano, Prentice-Hall of India, Private Limited, 2002.

Reference Books :

1. Switching and finite automate theory by Zvi Kohavi, Tata McGraw Hill, 2nd edition,
2. Switching and logic design – CVS Rao, Pearson, 2005.
3. Switching Theory and Logic Design – R.P. Jain, TMH Edition, 2003.
4. An Engineering Approach to Digital Design – Fletcher, PHI.

DMECE 304 : ANALOG COMMUNICATION

Unit - I

Noise, Interference and Distortion: Introduction, Thermal noise, Shot noise, Partition noise, Low frequency, or flicker, noise, Burst noise, Avalanche noise, Bipolar transistor noise, Field-effect transistor

noise, Equivalent input noise generators and comparison of BJTs and FETs, signal-to-noise ratio, S/N ratio of a tandem connection, Noise factor, Amplifier input noise in terms of F , Noise factor of amplifiers in cascade, Noise factor and equivalent input noise generators, Noise factor of a lossy network, Noise temperature, Measurement of noise, Temperature and noise factor, Narrow band, band-pass noise

Unit - II :

Amplitude Modulation: Introduction, Amplitude modulation, Amplitude modulation index, Modulation index for sinusoidal AM, Frequency spectrum for sinusoidal AM, Average power for sinusoidal AM, Effective voltage and current for sinusoidal AM, Non-sinusoidal modulation, Double-sideband suppressed carrier (DSBSC) modulation, Amplitude modulator circuits, Amplitude de-modulator circuits

Unit - III:

Single-Sideband Modulation : Introduction, Single-sideband principles, Balanced modulators, SSB generation, SSB reception, Modified SSB systems, Signal-to-noise ratio for SSB, Companded single sideband

Unit - IV:

Angle and Pulse Modulation : Introduction, Frequency modulation, Sinusoidal FM, Frequency spectrum for sinusoidal FM, Average power in sinusoidal FM, Non-sinusoidal modulation, Deviation ratio, Measurement of modulation, Measurement of modulation index for sinusoidal FM, Phase modulation, Equivalence between PM and FM, Sinusoidal phase modulation, Digital phase modulation, Angle modulator circuits, Pulse amplitude modulation (PAM), Pulse code modulation (PCM), Pulse frequency modulation (PFM), Pulse time modulation (PTM), Pulse position modulation (PPM), Pulse width modulation (PWM)

Unit - V:

Transmitters and Receivers : Amplitude modulated transmitters, FM transmitters, Angle modulation detectors, Automatic frequency control, Amplitude limiters, Noise in FM systems, Pre-emphasis and

de-emphasis, Introduction to receivers, Super heterodyne receivers, Tuning range, Tracking, Sensitivity and gain, Image rejection, Spurious responses, Adjacent channel selectivity, Automatic gain control (AGC), Double conversion, Electronically tuned receivers (ETRs), Integrated-circuit receivers, AM receivers, FM broadcast receivers, FM stereo receivers

Text Book :

Electronic Communications by Dennis Roddy and John Coolen, Pearson Education, 2003.

Reference Books :

1. Communication Systems by B.P. Lathi, BS Publication, 2004.
2. Analog and Digital Communications by Simon Haykin, John Wiley, 2005.
3. Analog and Digital Communication by K. Sam Shanmugam, Wiley, 2005.

DMECE 305 : CONTROL SYSTEM ENGINEERING

Unit - I

Basic components of a control system, examples of control system applications, open-loop control systems (non feedback), closed- loop control systems (feedback), modeling of mechanical system elements- translational motion, rotational motion, conversion between translational and rotational motions, DC and AC servomotors, AC tachometer, synchros, AC and DC position control systems using differential equations, transfer functions, block diagrams of control systems and signal graphs, reduction techniques for complex block diagrams and signal flow graphs, comparison of feedback and non-feedback systems.

Unit - II

Concept of stability, relationship between characteristic equation roots and stability, methods of determining stability, Routh- Hurwitz criterion, Routh's tabulation, stability of discrete data systems, stability tests of discrete- data systems, time response of first order and second order

system, steady state error, unit time response and time domain specifications, time domain analysis of a position control system, effect of adding poles and zeros to transfer functions, dominant poles of transfer functions

Unit – III:

Basic properties of the Root Loci , properties and construction of Root Loci, some important aspects of the construction of the Root Loci

Unit – IV:

Frequency response of closed loop systems, frequency domain specifications, resonant peak, resonant frequency, and bandwidth of the prototype second order system, polar plots, Bode plots, Nyquist stability criterion

Unit – V:

State variable analysis: Concept of state, state variables and state model, state model for linear continuous time systems, solution of state equations, concept of controllability and observability

Text books:

1. Automatic Control Systems by Benjamin C. Kuo, Prentice-Hall of India Private Limited, 2003
2. Control systems Engineering by I.I.Nagrath & M. gopal, Wiely eastern Ltd

Reference Books :

1. Modern Control engineering by K. Ogata, Prentice Hall.
2. Control Systems Engineering by NISE 3rd Edition, John Wiley.

DMECE 306 Microprocessors and Microcontrollers

Unit –I:

The microprocessor based personal computer system, internal architecture of 8086, real mode memory addressing, protected mode memory addressing, memory paging, Data addressing modes, program

memory addressing modes, stack memory addressing modes, pin-outs and the pin function of 8086, 8284 clock generator, bus buffering and latching, bus timing, ready and wait state, minimum and maximum mode.

Unit – II:

Data movement instructions- MOV revisited, PUSH/POP, load effective address, string data transfer, Arithmetic and Logical instructions , Program control instructions- jump, if-then, while- do, repeat- until, Introduction to interrupts, hardware interrupts, machine control and miscellaneous instructions, modular programming

Unit –III:

Memory devices, address decoding, 8086 (16-bit) memory interface, introduction to I/O interface, I/O port address decoding, the programmable peripheral interface, the 8279 programmable keyboard/display interface, 8254 programmable interval timer, 8259A programmable interrupt controller, basic DMA operation, the 8237 DMA controller, data formats for the Arithmetic Coprocessor, the 8087 architecture.

Unit – IV:

80186/80188 architecture, programming the 80186/ 80188 enhancements, introduction to the-80286, 80386, 80486, Pentium processor, and Pentium pro microprocessor, 80386 registers and memory management, moving to protect mode, virtual 8086 mode. Introduction to RISC processors.

Unit – V:

Over view of the 8051 family, inside the 8051, introduction to 8051 assembly programming, the program counter and ROM space in the 8051, flag bits and PSW register, register banks and stack of 8051, addressing modes and instruction set of 8051, introduction to embedded systems.

Text books:

1. Microprocessors and Interfacing programming and hardware

- by Douglas V.Hall, Tata McGraw- Hill Publishing company limited,2001.
2. The Intel microprocessors 8086/8088, 80186/ 80188, 80286, 80386, 80486, Pentium and Pentium pro processor architecture, programming, and interfacing by Barry B. Brey, Prentice- Hall of India private limited,1997.
 3. The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi, Janice Gillispie Mazidi, Prentice- Hall of India private limited, 2005.

Reference Books:

1. 8051 Microcontroller – Kenneth J. Ayala, Penram International/ Thomson, 3rd Edition, 2005.
2. Micro Computer systems, The 8086/8088 Family Architecture Programming and Design by Y.Liu and G.A. Gibson, Phi, 2nd Edition.

ELECTIVE I

DMECE307 (A) : Passive and active filter design

Unit – I:

Positive real functions, Testing driving point functions, Driving point synthesis of LC and RC networks, Minimum phase functions

Unit – II:

Image parameter filter design : Image impedance, Iterative impedance, Characteristic impedance, Constant K – filters, m-derived filters, composite filters, Frequency translation through reactance transformation.

Unit – III:

Ideal filter characteristics and their limitations, Butterworth and Chebysev approximations, their comparison, Insertion loss synthesis, Coefficient matching techniques,

Unit – IV:

Active network elements : Controlled sources, impedance converters, Impedance inverter, Generalized impedance converter with

two amplifiers, Gytrators, FDNR, FDNC, Activity and passivity of network, Useful network theorems : LC-RC transformation, RC-CR transformation, conversion of T.F. realization to driving point function synthesis, Transformation of driving point function synthesis to transfer function realization, Theorems on polynomial decomposition, Synthesis using controlled sources : Synthesis of driving point functions, Synthesis of transfer functions, network design by coefficient matching techniques

Unit – V:

Analysis of networks containing ideal elements, Analysis of networks containing operational amplifiers, Bilinear form of network functions, Indefinite admittance matrix method, Sensitivity considerations (Atre's Book), Synthesis of transfer functions : Mathew-Seifert's approach, Lovering's method, A general method using a differential input amplifier, Realization of all pass functions, Network design by coefficient matching techniques : Bohn's method, Brennam and Bridgman's method, A minimum sensitive realization of transfer function, Universal active filter.

Text Books :

1. Introduction to modern network synthesis by M.E. Van Valkenberg, Wiley Eastern Limited,
2. Network theory and filter design by Vasudev K Aoutre, Wiley Eastern Limited,
3. Analysis and synthesis of linear active networks by S.K. Mitra, John Wiley & Sons Inc., New York / London / Sydney / Toronto.

Reference Books :

1. Synthesis of passive networks by E.A.Guillemain
2. Modern filter theory and design by Gabor. C. Temes, S.K.Mitra, John Wiley and Sons.
3. Theory and Design of active RC Circuits by L.P. Huelsman, TMH Edition.

DMECE308 LINEAR & DIGITAL ICS CIRCUITS AND APPLICATIONS

Unit - I

The operational amplifier, Block diagram representation of typical op-amp, Analysis of typical op-amp equivalent circuit, Schematic symbol, Integrated circuit, Types of integrated circuits, Manufactures designations for integrated circuits, Development of integrated circuits, Integrated circuit package types, pin identification and temperature ranges, The ideal op-amp, Equivalent circuit of an op-amp, Ideal voltage transfer curve, Open-loop op-amp configurations-The differential amplifier, The inverting amplifier, The non-inverting amplifier, Input offset voltage, input bias current, input offset current, total offset voltage, thermal drift, effect of variation in power supply voltages on offset voltage, change in input offset voltage and input offset current with time, common mode configuration and common mode rejection ratio

Unit - II

Block diagram representation of feedback configurations, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Differential amplifier, frequency response, compensating networks, frequency response of - internally compensated Op- amplifier, non compensated Op-amplifier, high frequency Op-amp equivalent circuit, open-loop voltage gain as a function of frequency, closed loop frequency response, slew rate.

Unit - III

DC and AC amplifiers, AC amplifiers with a single supply voltage, the peaking amplifier, summing, scaling, and averaging amplifiers, instrumentational amplifier, differential input and differential output amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, first order low pass butter worth filter, second order low pass butterworth filter, bandpass filter, band rejection filter, all pass filter, oscillators-phaseshift, wien bridge, generators-square, triangular, sawtooth wave, voltage controlled oscillator

Unit - IV

Basic comparator, comparator characteristics, zero crossing detector, schmitt trigger, voltage limiter, voltage to frequency and frequency to voltage converters, analog to digital and digital to analog converters, clippers and clampers, peak detector, sample and hold circuit, the 555 timer- as a monostable, astable, phase locked loops, voltage regulators.

Unit - V

CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, bipolar logic, transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, emitter coupled logic, comparison of logic families, IC's specifications

Text books:

1. Op-Amps and Linear Integrated Circuits by Ramakanth A. Gayakward, Prentice – Hall of India private limited, 2002.
2. Digital design principles and practices by John F. Wakerly, PHI/ Pearson Education, 2005.

Reference Books :

1. Linear Integrated Circuits by D.Roy Chowdhury, New Age International (p) Ltd, 2nd edition, 2003.
2. Introduction to Logic Design by Alan B.Marcovitz, TMH, 2nd Edition, 2005.

DMECE 309 ANALOG COMMUNICATION LAB

Generation of AM signal and measurement of modulation index, diode detector for AM signals, Generation of FM modulation signal, FM detector, Receiver measurements, Balanced modulator, Delayed AGC, Bandpass filter, LPF, Pre-emphasis and de-emphasis, Twin-T, attenuator, Equalizer, SSB, Frequency multiplier/limiter, Synthesizing a TF Bode's method, PLL, HPF, IF amplifier (discrete & IC version), active filters

DMECE 310 ELECTRONICS-II LAB

Feedback amplifier, RC phase shift oscillator, Wien bridge oscillator, Colpitts oscillator, Operational amplifier as an inverting and non-inverting amplifier, Measurement of operational amplifier parameters, Amplifications of operational amplifier, RC low pass and high pass circuits, Clipping and clamping circuits, Collector coupled astable multi, Monostable multi, Bistable multi, Schmitt trigger, UJT sweep generation and measurement of errors, Miller or bootstrap sweep generator

DMECE 311 LINEAR AND DIGITAL IC LAB

Transfer characteristics of TTL gate and CMOS gate, Function generator using OP Amp. or similar application using OP Amp., Applications of 723 regulator IC, Study of analog comparator characteristics, Experiments on basic AND, OR, NOT and Exclusive OR function realizations using SSI, gates, Experiments on decoders using 74LS139, Experiments on buffers (three-state and bidirectional) and transreceivers using 74LS125, 74LS126 and other appropriate IC circuits, Experiments on priority encoders using 74LS148, Experiments using multiplexers ICs (Function generation and other applications), Experiments using demultiplexers (use 74LS125 and other ICs), Experiments on Odd and even parity circuits using SSI and MSI circuits, Experiments on 4-bit and comparators using exclusive or gates, Experiments on 4-bit comparators using exclusive or gates, Experiments on 4-bit and 8-bit adders and subtractor using 74LS83, Experiments using 74LS181 and 75LS182 ICs, Experiments on combinational multiplexers using 74284 and 74285 MSI circuits, Experiments on SR latch and master-slave JK flip-flop using SSI gates, Synthesis and testing of positive edge triggered D-flip-flop, Design and testing of ripple counters using ICs, Design and testing of Mod-K synchronous counters, Study of operational characteristics of all 5 types of shift registers, Experiments using ROMs, A digital attenuator using 2764, A PCM companded encoder using 27512, PLAs to realize SOP functions using IC 828100, To realize binary-select multiplexer using PAL 16L8.